collection, and that value would have been much enhanced if the scientific section had been subdivided into definite sections, and the order in the catalogue had corresponded to the order on the walls, as we have previously advocated. But the student will be well repaid for the trouble that is imposed upon him of sorting out the exhibits for himself.

Telephotography, or, as we prefer to call it, large-image photography—for the only function of a telephotographic lens is to enlarge the image before it falls upon the sensitive surface, and whether the original image is small by reason of the distance of the object or because of its size makes no difference—is better represented probably than ever before. The well known "Mont Blanc," by M. Fred. Boissonnas, is on view again, also an early telephotograph by the late Prof. W. K. Burton, of interest because of its age. But the most striking and new applications of this kind of work are shown by M. Fred. Boissonnas of enlargements of telephotographs. He gives several examples in sets of three:—(1) a photograph with an ordinary lens; (2) with a telephotographic lens; (3) an enlargement of the latter, the proportional sizes being approximately as 1 : 5 : 24. Thus a measurement of one inch on the first becomes two feet on the last, and the detail, vigour and general quality of the enlargements are surprising, and demonstrate the fine quality of the image given by the telephotographic lens.

The gradual changes that take place during rapid movement or slow development are well represented by three new series. Sixteen radiographs showing the various stages in the incubation of a pigeon's egg, by Mr. M. W. Martin, enable one to trace the process very clearly, the first appearance of blood vessels and of the beak being quite marked, and the final packing of the two parts of the shell together ready for removal from the nest by the old bird fitly completes the series. Mr. Martin also exhibits a beautifully made series of forty radiographs illustrating the evolution of the common frog, appropriately finishing with an old frog which has broken its leg. The life-history of a splash is well shown by Mr. A. C. Banfield in a series of thirty-six photographs.

Colour work is not so much in evidence as it was at the last two or three exhibitions. We have no opportunity of judging whether any appreciable advance has been effected, because in no case is the original object shown with the photograph. For this reason many of these exhibits have no value, for we do not need at the present day any proof that photographs in colour can be produced.

Photomicrography is well represented. The student will probably be specially interested in Mr. Spitta's "small garden spider," ×20, taken with a 50mm. planar, as a fine example of low-power work; the fourteen photographs of test objects, ranging up to a magnification of about 4300, also by Mr. Spitta, and Mr. Albert Norman's series of photographs of different bacilli.

We have not space to do more than mention the fact that the exhibition includes astronomical and spectroscopic photographs, as fine a series of photographs from balloons as, probably, has ever been brought together, photographs of many kinds of animals, birds, reptiles, insects, fishes, flowers, and plants; photographs in mines and quarries and dark factories, illustrations of waves and ripples and lightning, and many splendid reproductions by many different processes. The science of photography itself is represented by photomicrographs of film sections by Mr. Edgar Senior, including multiple films, and a Lippmann's colour photograph showing a very large number of layers of deposit due to the stationary waves, and Mr. Watkins's demonstrations of the validity of his time method of development.

NOTES.

THE fund established by Mrs. Elizabeth Thompson, of Stamford, Connecticut, "for the advancement and prosecution of scientific research in its broadest sense," now amounts to 26,000 dollars. As accumulated income will be available in January next, the trustees desire to receive applications for appropriations in aid of scientific work. Preference will be given to those investigations which cannot otherwise be provided for, which have for their object the advancement of human knowledge or the benefit of mankind in general, rather than to researches directed to the solution of questions of merely local importance. Further particulars can be obtained from the secretary of the Board of Trustees, Dr. C. S. Minot, Harvard Medical School, Boston, Mass., U.S.A. It is intended to make new grants in January, 1904. Decided preference will be given to applications for small amounts, and grants exceeding 300 dollars will be made only in very exceptional circumstances. The following list of grants for 1902 has not previously been recorded:—125 dollars to Dr. F. T. Lewis, Cambridge, Mass., for investigation of the development of the vena cava inferior; 150 dollars to Prof. Henry E. Crampton, New York, for experiments on variation and selection in Lepidoptera; 100 dollars to Prof. Frank W. Bancroft, Berkeley, Cal., for experiments on the inheritance of acquired characters; 250 dollars to Prof. John Weinzirl, Albuquerque, N.M., for investigation of the relations of climate to the cure of tuberculosis; 300 dollars to Prof. H. S. Grindley, Urbana, Ill., for the investigation of the proteids of flesh; 300 dollars to Dr. Herbert H. Field, Zürich, Switzerland, to aid the work of the Concilium Bibliographicum (an additional grant of 300 dollars was made June, 1903); 250 dollars to Dr. T. A. Jaggar, Cambridge, Mass., for experiments in dynamical geology; 50 dollars to Prof. E. O. Jordan, Chicago, Ill., for the study of the bionomics of Anopheles; 300 dollars to Dr. E. Anding, Munich, Bavaria, to assist the publication of his work, "Ueber die Bewegung der Sonne durch den Weltraum"; 300 dollars to Prof. W. P. Bradley, Middletown, Conn., for investigations on matter in the critical state; 300 dollars to Prof. Hugo Kronecker, Bern, Switzerland, for assistance in preparing his physiological researches for publication; 300 dollars to Prof. W. Valentiner, Heidelberg, Germany, for observations on variable stars.

PROF. VON BEHRING is reported to have brought before the Medical Congress at Cassel some new conceptions regarding tuberculosis. The fundamental idea of his theory is that tuberculosis in animals and in man represents different varieties of the same disease, and that it is transferable by the agency of tuberculous milk; in these respects he is in direct opposition to Prof. Koch. He distinguishes between adults and infants, maintaining that the former may as a rule safely partake of unsterilised milk, while infants are particularly liable to infection from that source, and he holds that infection may take place many years before the disease becomes manifest. Prof. Behring is now engaged in experiments upon new-born animals with the view of testing the possibility of rendering them immune against tuberculosis by supplying them with a suitable solution of tuberculous virus in the food. He is further inclined to believe that the milk of cows which have been rendered immune contains prophylactic elements which it will be practicable to employ in the treatment of the disease in human beings.

THE death is announced of M. A. Certes, formerly president of the French Zoological Society. M. Certes carried out numerous delicate researches on bacteria, and presented several memoirs to the Paris Academy of Sciences.

On the invitation of the leading engineering societies of the United States, it has been decided that the next autumn meeting of the Iron and Steel Institute shall be held in New York on October 24–26, 1904. After the meeting there will be an excursion to Philadelphia, Washington, Pittsburg, Cleveland, Niagara Falls, and Buffalo, returning to New York on November 10. Arrangements will also be made for a visit to the St. Louis Exhibition.

The death is announced of Mr. John Allen Brown, who was the author of numerous papers on geological and anthropological subjects, and of a volume "Palæolithic Man in North-west Middlesex."

The trials on the electric railway between Zossen and Marienfeld, near Berlin, have been continued during the past week, and on September 26 a speed of 118 miles an hour was attained, as against 114 miles recorded last week.

It has been decided to hold the American Conference on Tuberculosis at Washington on April 4–6, 1905, and not at St. Louis in 1904, as previously arranged. This course has been adopted so that the American meeting shall not clash with the International Congress on Tuberculosis to be held in Paris next year.

We learn from *La Nature* that M. Dybowski, the Inspector-General of Colonial Agriculture, has just been appointed by the Minister of French Colonies to undertake a mission to Senegal and French Guinea to study the conditions existing in these possessions with a view to future enterprise in the direction of agricultural colonisation.

The Harben lectures for 1903 will be given under the auspices of the Royal Institution of Public Health in King's College, London, by Prof. Ferdinand Hueppe, of Prague, on October 8, 12, and 15. The subjects for the respective days are:—(1) the etiology of infectious diseases from the standpoint of natural science; (2) hygienic lessons to be derived from the serum treatment; and (3) tuberculosis.

Two violent shocks of earthquake were felt on the night of September 22 at Blidah at an interval of three seconds. The total duration is estimated at fifteen seconds. The direction was from the south-east to the north-west. A slight shock lasting from four to five seconds was felt at Algiers at the same time. Two earthquake shocks also occurred in the Canaries on September 22, and caused cracks in the walls of several houses.

M. De La Vaulx made a balloon ascent from St. Cloud, Paris, at 7 p.m. on Saturday, September 26, and reached Hull at 11 o'clock on the following morning. The balloon started with a favourable wind, and reached the Channel at 1 a.m. on September 27, crossed it in an hour and fifty minutes, and passed over the Thames at 5 a.m. almost midway between Greenwich and Chatham. As the balloon skirted the Wash four hours later it was evident that the wind was changing. From there the voyage to the Humber occupied an hour and fifty minutes. When nearing Hull it was seen that the journey could not be continued without danger of being blown out to sea, so a descent was made at 11.40 six miles north-east of Hull.

A committee has been appointed by the Cunard Steamship Company to investigate the application of marine turbines to steamers, with special reference to the suitability of this class of engines for the two great vessels which are to be built under the agreement with His Majesty's Government. The Admiralty is represented by Engineer Rear-Admiral Oram, Deputy-Engineer-in-Chief of the Navy, and he will be assisted by Engineer Lieutenant Wood as secretary of the committee. Sir William White, late Director of Naval Construction, has also consented to give his assistance. Ordinary marine engines powerful enough to propel the projected Cunarders at 25 knots would be so excessively heavy that the comparative lightness of marine turbines would be a considerable advantage if their trustworthiness could be demonstrated. The questions of steam consumption and fuel economy of the turbines will also be investigated.

In a letter to the *Times* (September 15), Mrs. Garrett Anderson, M.D., gives a valuable analysis of the data published in the "Report of the Metropolitan Asylums Board" respecting the 1901–2 epidemic of small-pox, in order to discuss the evidence there afforded upon (1) the protective influence of infant vaccination and the limits of its duration; (2) the necessity for systematic revaccination at school age; (3) the cost to the ratepayers of the method now employed. In the epidemic of 1901–2, 9659 persons were admitted to the small-pox hospitals, of whom 1663 died, equal to 17·1 per cent. Disregarding all doubtful cases, in 1901, 264 vaccinated persons under twenty contracted small-pox, of whom 175 were between fifteen and twenty, that is, they had reached an age when the protective power of infant vaccination is seriously weakened. In 1901 there were no deaths of vaccinated children, whereas there were 65 deaths of unvaccinated children under ten. In 1902 there were no deaths of vaccinated children, but 337 deaths of unvaccinated children under seven. Among vaccinated children up to fifteen years of age who contracted the disease, the mortality did not exceed 1·7 per cent. at different age periods, while among the unvaccinated it was not less than 32 per cent. From fifteen to thirty years of age the mortality is 4·8 and 30·4 per cent. respectively among the vaccinated and unvaccinated. Even up to thirty years of age the protective power of infant vaccination is, therefore, still an important factor, but is evidently waning, emphasising the need for revaccination. As regards the cost of the epidemic, Mrs. Anderson points out the great expense the ratepayers have been put to in order to provide hospital accommodation; she estimates that in Battersea every case cost *71l. 7s. 1d.* There has to be added to this, of course, the economic loss to the community of the able-bodied through the sickness and death of those attacked.

We have received from Mr. H. C. Russell No. 7 of his interesting current papers. We are glad to see that the number of these papers is increasing year by year. Up to October, 1902, 105 notices had been recovered, and for the last seven years the number of papers amounted to 703. One of the bottles referred to in the last paper had a drift of 29·2 miles a day; it was thrown overboard in the Socotra Sea on January 28, and found in the Gulf of Aden on February 9, having travelled 350 miles in twelve days. With one exception, this is the most rapid drift on record, so far as this series of observations is concerned. The pamphlet is accompanied by charts illustrating the drift of the bottles.

Symons's Meteorological Magazine for September contains an interesting summary of the British Rainfall Organisation on the occasion of the retirement of Mr. Sowerby Wallis, who has been intimately connected with the undertaking for more than thirty years. Most of our readers are probably aware that the system was commenced by the late Mr. G. J. Symons in 1859, by hunting up old rainfall records and the collection of actual observations. The first results were published for 1860, from the records of 168 stations. In ten years the number of stations reached 1500, and in 1890 3000 stations. Dr. H. R. Mill, who has undertaken the sole management of the organisation, which is now recognised as of great national value, directs attention to the power of initiation possessed by the founder, as shown by the fact that the page of "British Rainfall" in 1860 hardly differed in arrangement from that at the present day, and states that in all essentials the work will be continued in the straight course which its founder impressed upon it.

IN the *Physical Review* for August, Mr. Edgar Buckingham describes a simple mechanical contrivance for tracing the family of curves which represent the adiabatics of a perfect gas.

VOL. iv. part ii. of the *Bibliotheca mathematica* contains an account of the life and works of the late Prof. P. G. Tait by Mr. Alexander Macfarlane, of South Bethlehem.

MR. FRANZ KERNTLER, of Budapest, has published a short article dealing with the potentials of the forces between elements carrying electric currents, according to Ampère's and allied laws. It is printed by the Pester Lloyd Gesellschaft.

IN the *Physical Review* for July and August, Messrs. E. F. Nichols and G. F. Hull describe experiments for determining the pressure due to radiation. In order to obtain results free from the effects due to the disturbing action of gases, (1) use was made of the most perfect reflecting surfaces to receive the radiation; (2) the action of a beam of constant intensity was studied in gases at different pressures; (3) the apparatus was arranged as a torsion balance, in such a way that the disturbing actions could in large measure be reversed; and (4) ballistic observations were made. It appears that the radiation pressure depends only on the intensity of radiation, and is independent of the wave-length, thus confirming the Maxwell-Bartoli theory within the probable errors of observation.

EAST AFRICAN chamæleons form the subject of an illustrated article by Mr. J. L. Monk in the September number of the *Zoologist*, to which serial Mr. W. W. Fowler contributes a note on what he believes to be an unknown warbler recently observed nesting in Oxfordshire.

IN the August number of the *Victorian Naturalist* Mr. W. Hopkins raises the question whether eels in Australia do not breed in fresh water. Among other facts, it is stated that in a swamp which had been dry for some months swarms of young eels made their appearance after the first rains.

IN the *American Naturalist* for July Dr. C. R. Eastman records a lung-fish with a cutting type of dentition from the Permian strata of Texas. Possibly the divergence from the normal form may be correlated with a change from marine to brackish water conditions, of which there are indications in the Permian; but in any case it is very remarkable in view of the singularly uniform type of dentition presented by the lung-fishes throughout their history. The new species is named *Sagenodus pertenuis.*

THE *Proceedings* of the Philadelphia Academy for June contain a description of a new species of Pleurotomaria from Japan. The shell resembles that of *P. beyrichi* in general form and characters, and if perfect would measure about 3 inches in height. To the same issue Mr. J. P. Moore contributes a long article on polychætous worms from Japan, Kamchatka, and Bering Sea, in the course of which many new forms are named and described; while in the section for July Messrs. Eigenmann and Kennedy have notes on fishes from Paraguay, accompanied by a synopsis of the American representatives of the cichlid group.

ONE of the most remarkable phenomena connected with Mont Pelée, in Martinique, is a gigantic plug of solidified lava which has been thrust up from the summit of the new cone of the volcano. This cone has been built up in the ancient crater-basin (the Étang Sec) to a height of 1600 feet or more, and it is now dominated by the ascending obelisk of lava, of which, through the courtesy of Prof. Angelo Heilprin, we are able to give a picture. The appearance of this mass of rock (as he tells us) was made known by Prof. Lacroix, and it calls to mind some of the pyramidated summits among the South American volcanoes. When first observed it must have been 1000 feet in height, and where implanted it has a thickness of some 300 to 350 feet. The plug has lost 180 feet, but when the photograph was taken (on June 13) it added 800 or 900 feet to the mountain, making the altitude more than 5000 feet. The obelisk terminates in a needle summit, a true *aiguille.* It is gently curved in the direction of St. Pierre, and on this face it is cavernous and slaggy, giving evidence that explosions have torn away portions of the lava. On the opposite side, the surface is more solid in appearance, and there it is smoothed and even polished, with grooves and striæ, like a slickensided surface—the result, evidently, of attrition when the mass was extruded. No doubt the lava was so rapidly solidified that it was unable to flow away, moving upwards, and receiving accretions to its mass from below. Prof. Heilprin observed that the growth during a period of four days measured six metres. Previously a growth of ten metres in eight days had been recorded by M. Giraud. The volcano was too active to permit of a descent into the crater-hollow; steam and sulphur-puffs were issuing, and avalanches of rock were disrupted from the obelisk. Pelée, as remarked by Prof. Heilprin (*Science*, August 7) was still "ugly."

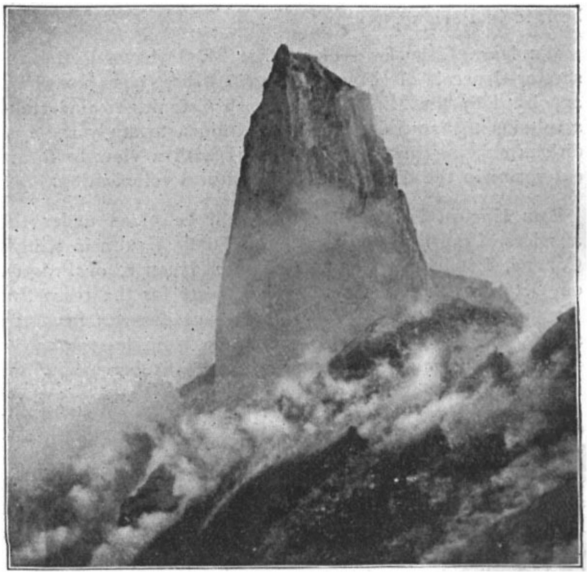

FIG. 1.—The Ascending Obelisk of Mont Pelée. Photograph by Prof. Angelo Heilprin, June 13, 1903, taken from the rim of the crater.

A NEW map of the world on an equal area projection has been published by Messrs. Darbishire and Stanford, Ltd., Oxford, price 6*d.* net. British possessions are coloured red, and the principal areas where corn, rice, and other food stuffs are at present grown are indicated by shading.

MESSRS. WATTS AND Co. have published for the Rationalist Press Association, Ltd., a carefully revised, popular edition of "Supernatural Religion. An Inquiry into the Reality of Divine Revelation." The new edition runs to 920 pages, and is issued at 6*s*. net.

DR. ADOLF MARCUSE, Privat-docent at the University of Berlin, having taken charge of the section of geographical surveying in the "Geographischen Jahrbuch," edited by Prof. Wagner, asks astronomers, geographers, and explorers to send him papers or other publications containing results of which notice should be taken.

AT the request of teachers of chemistry in secondary schools, Messrs. J. and A. Churchill have published separately, at 2*s*. 6*d*. net, the chapters on general chemistry contained in the "Elementary Practical Chemistry" of Dr. Clowes and Mr. J. B. Coleman. In its present form the book provides a really good course of experimental chemistry, in which the broad principles of the science are gradually presented to the student.

DR. F. BASHWORTH has prepared a pamphlet of thirty pages, published by the Cambridge University Press, containing "A Historical Sketch of the Experimental Determination of the Resistance of the Air to the Motion of Projectiles." The pamphlet gives a general survey of the author's experiments and results, which have extended over many years, and for which he devised his chronograph, and shows their relationship to other investigations.

A NEW edition of Dr. Alfred Russel Wallace's book, "The Wonderful Century. The Age of New Ideas in Science and Invention," has been published by Messrs. Swan Sonnenschein and Co., Ltd. The book has been revised and largely rewritten. Among the most important changes may be mentioned the addition of a chapter on electricity, of four chapters on astronomy, and the omission of the long chapter on the vaccination question which was included in former editions. In its new form the book provides an excellent survey of the development of science during the nineteenth century.

THIS year's issue of "Chemical Handicraft," the illustrated catalogue of chemical apparatus and reagents manufactured and sold by Messrs. John J. Griffin and Sons, Ltd., is attractively arranged and very complete. Among new apparatus we notice vessels of quartz glass scheduled on pp. 45–6. These vessels may be treated in the blowpipe flame without previous warming, and, whilst hot, be plunged into cold water without being fractured. Teachers of chemistry should find this catalogue of assistance in ordering the apparatus necessary for their laboratories and lecture-rooms.

WE have received copies of the first three *publications de circonstance* of the Conseil Permanent International pour l'Exploration de la Mer, published by MM. Høst & Fils, of Copenhagen. The first booklet is a preliminary communication, by Dr. C. G. Joh. Petersen, on how to distinguish between mature and immature plaice throughout the year; the second, by M. Martin Knudsen, deals with the standard-water used in the hydrographical research until July, 1903. The third is a larger book of 107 pages, and includes ten compendious monographs on the literature of the ten principal food fishes of the North Sea, illustrated by ten plates, and preceded by a useful index.

THE Tuesday evening popular science lectures at the Royal Victoria Hall, Waterloo Bridge Road, have been the means of creating scientific interest and activity among many people who have attended them. Many men of science have given their services as lecturers at the hall, and have helped to make known the work that is being carried on there. An appeal is now being made for subscriptions to assist the committee to meet the expenditure of 3000*l*. for alterations which had to be undertaken in order to make the building fireproof to the satisfaction of the London County Council. Donations should be sent to Miss Emma Cons, honorary secretary, Royal Victoria Hall, London, S.E.

THE additions to the Zoological Society's Gardens during the past week include two Sacred Baboons (*Papio hamadryas*), two Variegated Jackals (*Canis variegatus*), two Spotted Hyænas (*Hyaena crocuta*), a Striped Hyæna (*Hyaena striata*), a Lion (*Felis leo*), a Leopard (*Felis pardus*), an Abyssinian Duiker (*Cephalophus abyssinicus*), three Somali Ostriches (*Struthio molybdophanes*) from Somaliland, presented by Mr. William Northrup McMillan; a Diana Monkey (*Cercopithecus diana*) from West Africa, presented by Mr. A. G. Turner; two Pig-tailed Monkeys (*Macacus nemestrinus*) from Java, presented by Mr. — Eussens; an Otter (*Lutra vulgaris*), British, presented by Miss Boughey; two Gold-fronted Finches (*Metoponia pusilla*) from India, presented by Mr. H. C. Harper; two Black Salamanders (*Salamandra atra*) from Switzerland, presented by Mr. W. C. Worsdell; three Indian Chevrotains (*Tragulus meminna*), nine Starred Tortoises (*Testudo elegans*) from India, a Mayotte Lemur (*Lemur mayottensis*), a Fringed Gecko (*Uroplates fimbriatus*), six Green Geckos (*Phelsuma madagascariensis*), twelve Blackish Sternotheres (*Sternothoerus nigricans*), a Sharp-nosed Snake (*Lioheterodon madagascariensis*) from Madagascar, four Angulated Tortoises (*Chersina angulata*) from South Africa, fourteen Stink-pot Terrapins (*Cinosternum odoratum*), two Prickly Trionyx (*Trionyx spinifer*) from North America, a Spiny-tailed Mastigure (*Uromastix acanthinurus*) from North Africa, three Cuban Snakes (*Liophis andrae*) from Cuba, a Merrem's Snake (*Rhadinoea merremi*) from Brazil, deposited.

OUR ASTRONOMICAL COLUMN.

ASTRONOMICAL OCCURRENCES IN OCTOBER:—

Oct. 5. 13h. 48m. to 17h. 0m. Transit of Jupiter's Sat. III. (Ganymede).
6. Partial eclipse of the moon.
5h. 32m. Moon rises obscured by the penumbra.
6h. 7m. Last contact with the penumbra.
10. 8h. 18m. to 9h. 11m. Moon occults α Tauri (Aldebaran, Mag. 1·1).
15. Venus. Illuminated portion of disc = 0·188, of Mars = 0·907.
18. 9h. 41m. Minimum of Algol (β Persei).
,, 15h. 0m. Mercury at greatest elongation (18° 13′ W.).
,, 19h. 0m. Mercury in conjunction with moon, Mercury 1° 57′ N.
19–22. Epoch of Orionid meteoric shower (Radiant 91° + 15°).
21. 6h. 30m. Minimum of Algol (β Persei).
22. Saturn. Polar diameter = 15″·7. Minor axis outer ring = 13″·62.
24. 3h. Mars in conjunction with Uranus, Mars 1° 13′ S.
,, 12h. Venus at greatest brilliancy.
31. 7h. Jupiter in conjunction with moon, Jupiter 3° 39′ S.